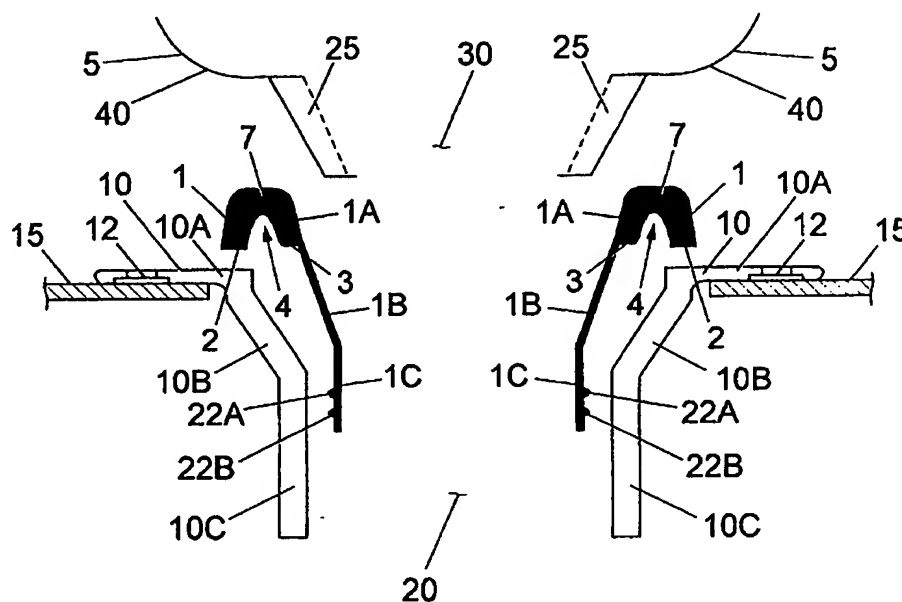


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(54) Title: A SEAL FOR A TOILET OUTLET



(57) Abstract

A seal (1) for a toilet outlet is described, where the toilet outlet comprises a waste outlet from a toilet bowl (5). A connection device, such as a flange (10), for connecting the waste outlet to a waste removal system, is also described. The seal (1) is adapted to provide a seal between the waste outlet and the connection device, where the direction of travel of the waste from the waste outlet to the connection device is substantially vertical. The seal (1) is formed from a resilient material.

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1 "A Seal for a Toilet Outlet"

2

3 The present invention relates to a seal for a toilet
4 outlet, particularly but not exclusively, to a seal for
5 a toilet outlet where the outlet is arranged such that
6 waste passes through the outlet in a substantially
7 vertical direction.

8

9 Conventionally, in some countries and particularly the
10 United States of America, the waste outlet of a toilet
11 is formed in the base of the porcelain toilet bowl. A
12 flange is mounted in the floor of the bathroom, where
13 the flange is connected to the municipal waste water
14 system. It has been known for many years, particularly
15 in the United States of America, to use a seal formed
16 exclusively from beeswax to provide a seal between the
17 waste outlet of the porcelain toilet bowl and the
18 flange. However, this beeswax seal introduces problems
19 during assembly of the porcelain toilet bowl to the
20 municipal waste water system, in that once the wax has
21 been distorted through installation or movement of the
22 toilet bowl, the wax remains distorted. This
23 distortion or "melting" of the wax degrades the seal
24 between the porcelain toilet bowl and the flange
25 mounted in the floor, and thus in many instances a

1 fluid tight seal cannot be achieved. Also, the wax
2 seal cannot be re-used.

3
4 According to the present invention, there is provided a
5 seal for a toilet outlet, the toilet outlet comprising
6 a waste outlet from a toilet bowl for fluid connection
7 with a waste removal system, the seal being adapted to
8 provide a seal between the waste outlet and the waste
9 removal system, wherein the direction of travel of the
10 waste from the waste outlet to the waste removal system
11 is substantially vertical, and characterised in that
12 the seal is formed from a resilient material.

13
14 Typically, the toilet outlet further comprises a
15 connection device for connecting the waste outlet to
16 the waste removal system.

17
18 Preferably, the seal is formed from a material having
19 one, some or all of the following characteristics;
20 elasticity, the ability to regain its original shape or
21 position after bending, stretching, compression or
22 other deformation. In a preferred embodiment of the
23 invention, the resilient material may be rubber.

24
25 Typically, the waste outlet is located on the lowermost
26 portion of the toilet bowl, and typically, the waste
27 outlet protrudes downwardly from the toilet bowl. At
28 least a portion of the waste outlet may be frusto-
29 conically shaped, with the greatest cross-sectional
30 area of the waste outlet vertically uppermost.

31
32 Typically, the seal comprises a bore through which
33 waste can travel, and typically, the seal is generally
34 symmetrical about the longitudinal axis of the bore.

35
36 The seal may comprise, when in use, an upper portion,

1 and in a preferred embodiment, the upper portion
2 typically further has a recess formed therein, the
3 recess providing for displacement of the upper portion.
4 As an alternative to the recess the upper portion may
5 be solid but may simply be compressible, and may have a
6 softer core to assist and direct compression.

7
8 Typically, the upper portion comprises an upper surface
9 against which a portion of the bottom of the toilet
10 bowl seats, in use.

11
12 The recess in the upper portion may be a groove.

13
14 In a preferred embodiment of the invention, the upper
15 portion of the seal may comprise at least two annular
16 seals, which are preferably coupled to a body, and
17 typically, when not in use of the seal, the groove in
18 the upper portion of the seal is provided in the region
19 defined between the two annular seals and the body.
20 Typically, in use of the seal, the annular seals of the
21 upper portion of the seal are vertically lowermost, and
22 the body is vertically uppermost, and typically
23 respective ends of the body are each coupled to one of
24 the annular seals.

25
26 Preferably, the base of at least one of the annular
27 seals forms a seal surface, typically sealing against a
28 seal surface provided on the connection device, and the
29 connection device may be a flange, and may further be a
30 floor-mounted flange.

31
32 In use of the seal, and in a preferred embodiment, the
33 two annular seals may be compressed toward one another
34 by the compressive force provided by the weight of the
35 toilet bowl, and preferably, the annular seals are
36 displaced towards one another to a substantial extent

1 such that they bear against one another. In this
2 scenario, the groove is substantially collapsed, and
3 preferably, the base of the two respective annular
4 seals form respective seal surfaces for sealing
5 engagement against a seal surface provided on the floor
6 mounted flange.

7
8 Alternatively, the two annular seals may be splayed
9 apart from one another by the compressive force
10 provided by the weight of the toilet bowl, and
11 typically faces of the annular rings which are adjacent
12 the groove provide respective seal surfaces for sealing
13 engagement against the sealing surface provided on the
14 floor mounted flange.

15
16 Typically, the upper portion of the seal comprises an
17 inner annular seal and an outer annular seal, and
18 preferably, the inner annular seal is located radially
19 inwardly of the outer annular seal. Typically, the
20 outer annular seal is coaxial with respect to the inner
21 annular seal.

22
23 Typically, the seal further comprises a lower portion
24 which is coupled to the upper portion, and which is
25 provided with at least one sealing element for sealing
26 engagement against a lower portion of the connection
27 device, and preferably, against a lower portion of the
28 flange. Typically, the sealing element is a seal ring
29 which is preferably arranged on the outer circumference
30 of the lower portion, and more preferably, the seal
31 ring protrudes outwardly from an outer circumference of
32 the lower portion to seal against an inner
33 circumference of the flange. Typically, there are a
34 plurality of seal rings provided on the lower portion,
35 and preferably, the plurality of seal rings are axially
36 spaced with respect to the longitudinal axis of the

1 bore of the seal. In a preferred embodiment of the
2 invention, there may be two axially-spaced seal rings.
3 They can be of different diameter for different sizes
4 of pipe and flange.

5

6 Preferably, the seal further comprises a middle portion
7 which couples the upper portion of the seal to the
8 lower portion, and typically, the inner diameter of the
9 upper portion of the seal is of a different diameter to
10 the inner diameter of the lower portion, and typically,
11 the middle portion is frusto-conically shaped, with one
12 end of the middle portion being coupled to the upper
13 portion, and the other end being coupled to the lower
14 portion.

15

16 Typically, the outer diameter of the upper portion of
17 the seal is greater than the outer diameter of the
18 lower portion.

19

20 Typically, at least a portion of the outer and/or inner
21 annular seals may be folded eg in a form similar to a
22 concertina. This provides the advantage that the wall
23 of the inner annular seal will more readily collapse
24 when weight is placed on the upper portion such that an
25 enhanced seal is achieved.

26

27 An embodiment of the present invention will now be
28 described, by way of example only, and with reference
29 to the accompanying drawings, in which:-

30

31 Fig. 1 is an exploded assembly cross-sectional
32 view of a first example of a seal in accordance
33 with the present invention prior to installation
34 between a toilet bowl and a flange;

35 Fig. 2 is a cross-sectional view of the seal of
36 Fig. 1 in more detail;

1 Fig. 3 is a cross-sectional view of the seal of
2 Fig. 1 in a first alternative configuration
3 installation between a toilet bowl and a flange;
4 Fig. 4 is a cross-sectional view of the seal of
5 Fig. 1 in a second alternative configuration of
6 installation between a toilet bowl and a flange;
7 Fig. 5 is a cross-sectional view of one half of a
8 second example of a seal in accordance with the
9 present invention;
10 Fig. 6 is a cross-sectional view of one half of a
11 first alternative upper seal portion in the form
12 of a 'C'-shaped section;
13 Fig. 7 is a cross-sectional view of one half of a
14 second alternative upper seal portion in the form
15 of an 'O'-ring section;
16 Fig. 8 is a cross-sectional view of one half of a
17 third alternative upper seal portion in the form
18 of a 'Y'-shaped section;
19 Fig. 9 is a cross-sectional view of one half of a
20 fourth alternative upper seal portion in the form
21 of a 'Lip' section;
22 Fig. 10 is a cross-sectional view of one half of a
23 portion of a first alternative lower seal portion;
24 Fig. 11 is a cross-sectional view of one half of a
25 portion of a second alternative lower seal
26 portion;
27 Fig. 12 is a cross-sectional view of one half of a
28 portion of a third alternative lower seal portion;
29 Fig. 13 is a cross-sectional view of one half of a
30 fifth alternative upper seal portion in the form
31 of a 'U'-shaped section;
32 Fig. 14 is an exploded assembly cross-sectional
33 view of a seventh example of a seal in accordance
34 with the present invention during installation
35 between a toilet bowl and a flange;
36 Fig. 15 is a cross-sectional view of an eighth

1 example of a seal in accordance with the present
2 invention;

3 Fig. 16 is a cross-sectional view of an ninth
4 example of a seal in accordance with the present
5 invention;

6 Fig. 17 is a cross-sectional view of an tenth
7 example of a seal in accordance with the present
8 invention;

9 Fig. 18 is an exploded assembly cross-sectional
10 view of an eleventh example of a seal in
11 accordance with the present invention during
12 installation between a toilet bowl and a flange,
13 where the flange is omitted from Fig. 18;

14 Fig. 19 is a cross-sectional view of a twelfth
15 example of a seal in accordance with the present
16 invention; and

17 Fig. 20 is a cross-sectional view of the seal of
18 Fig. 14 in isolation from the toilet and flange.

19

20 Fig. 1 shows a first example of a seal 1 in accordance
21 with the present invention, where the seal is formed
22 from a suitable material such as rubber, thermoplastic
23 rubber polyurethane or other elastomeric materials,
24 where the seal 1 is shown just prior to installation of
25 a toilet bowl 5 into a flange 10, where a portion of
26 the floor 15 is shown.

27

28 In order to install a toilet, a hole 20 is first
29 prepared in the floor 15, with appropriate pipework
30 (not shown in Fig. 1 but shown in Fig. 14), connecting
31 the hole to the municipal waste water system.

32

33 A flange 10 is then inserted into the hole 20 and fixed
34 in position (as will be described subsequently). The
35 flange can be installed before or after the pipework.
36 The flange 10 comprises three main portions, these

1 being an upper flange portion 10A, a middle flange
2 portion 10B, and a lower flange portion 10C. The lower
3 flange portion 10C is either coupled directly to the
4 municipal pipework, by for instance being solvent
5 welded by use of adhesive therebetween, or has an
6 appropriate O-ring seal acting between the lower flange
7 portion 10C and the pipework. The upper end of the
8 lower flange portion 10C is integrally formed with the
9 middle flange portion 10B, where the middle flange
10 portion 10B is preferably frusto-conical in shape (it
11 can be straight), with the smaller cross-sectional area
12 being located at the junction with the lower flange
13 portion 10C. The upper end of the middle flange
14 portion 10B is coupled to the upper flange portion 10A,
15 which is in the form of a disc, with the disc
16 projecting outwardly from the junction with the middle
17 flange portion 10B.

18
19 Flange 10 is arranged, in use, such that the lower
20 surface of the upper flange portion 10A is horizontal
21 with respect to, and seats against, the upper surface
22 of the floor 15 surrounding the hole 20. Screw or bolt
23 holes are provided in the upper flange portion 10A to
24 permit the insertion of screws (not shown) or bolts
25 (not shown) to secure the flange 10 to the floor, such
26 that the flange 10 is in the configuration shown in
27 Fig. 1. There are typically a plurality of upwardly
28 projections bolts (not shown) coupled to the upper
29 surface of the upper flange portion 10A, where the
30 bolts are arranged to locate in respective recesses,
31 grooves or holes formed on the lower surface of the
32 toilet bowl 5 to aid correct alignment of the toilet
33 bowl 5 during its installation. The bolts preferably
34 are T-headed and locate in the holes 12 in the flange.
35 The bolts can be fitted to the holes 12 by inserting
36 their T-shaped heads into the narrower upper portions

1 of the holes, and rotating them through 90 degrees.
2 These can then be held captive in the holes 12 and
3 project upwardly into cooperating holes in the base of
4 the toilet. Nuts can then be offered to the bolts and
5 tightened to compress the seal. There can be separate
6 countersunk holes (not shown) in the seal for screws or
7 other fixings to attach the seal to the floor. The seal
8 can therefore be compressed by the weight of the
9 toilet, by compression of the T-headed bolts, or by
10 bolts which connect the toilet to the floor so that the
11 seal is compressed between the floor and the toilet by
12 the action of the bolts.

13

14 It should be noted that the flange is not essential,
15 and it would be possible to install a seal into an
16 upwardly pointing end of a pipe. The seal can simply
17 be inserted into the pipe.

18

19 The seal 1 comprises three main portions, which are all
20 formed integrally, these being an upper seal portion
21 1A, and middle seal portion 1B, and a lower seal
22 portion 1C.

23

24 The upper seal portion comprises an outer ring 2 and an
25 inner annular seal ring 3 where the outer 2 and inner 3
26 rings are conjoined by means of a body member 7. The
27 outer 2 and inner 3 rings are radially spaced apart,
28 such that a groove 4 is provided therebetween.

29 Therefore, the cross-section of the upper seal portion
30 1A takes the shape of an inverted "U", with the lower
31 surfaces of the outer 2 and inner 3 rings providing a
32 horizontal sealing surface when the seal ring 1 is in
33 the configuration shown in Fig. 1. The innermost point
34 of the inner ring 3 provides a coupling point at which
35 the middle seal portion 1B is coupled to the upper seal
36 portion 1A. The middle seal portion 1B is frusto-

1 conical in shape, with its greatest cross-sectional
2 area located at the junction to which the middle seal
3 portion 1B is coupled to the upper seal portion 1A.
4 There are typically a plurality of upwardly projecting
5 T-headed bolts (not shown) coupled to the upper surface
6 of the upper flange portion 10A through holes 12, which
7 are arranged to locate in respective recesses, grooves
8 or preferably holes formed on or through the lower
9 surface of the toilet bowl 5 to aid correct alignment
10 of the toilet bowl 5 during its installation, and to
11 fix it to the flange. These can be holes through the
12 base of the toilet.

13
14 The lower seal portion 1C is coupled to the lower end
15 of the middle seal portion 1B, and takes the form of a
16 tubular ring. Toward the lower end of the lower seal
17 portion 1C are located two vertically spaced seal rings
18 22A, 22B. It should be noted that in actual use of the
19 seal 1, the upper 22A and lower 22B seal rings would
20 provide an interference fit with the inner diameter of
21 the lower flange portion 10C, and would not be radially
22 spaced therefrom as is incorrectly shown in Fig. 1.

23
24 The lower end of the toilet bowl 5 is shown in Fig. 1,
25 as comprising a waste outlet 30. The waste outlet 30
26 is bounded by a waste outlet pipe 25 which projects
27 downwardly from the base of the toilet bowl 5, and as
28 shown in Fig. 1, the waste outlet pipe 25 is preferably
29 frusto-conical in shape, with its smallest cross-
30 sectional area located vertically lowermost.

31
32 The toilet bowl 5 is installed as follows:-

33
34 The flange 10 is first inserted into the hole 20, and
35 preferably screws or bolts are inserted into the screw
36 or bolt holes (not shown) of the flange to secure the

1 flange to the floor 15. The seal 1 is then placed into
2 the open upper mouth of the flange 10, such that the
3 upper 22A and lower 22B seal rings are sealed against
4 the inner diameter of the lower flange portion 10C, and
5 at least the horizontal sealing surface of the outer
6 ring 2 seats against the upper surface of the upper
7 flange portion 10A. In fact, it is preferred that the
8 horizontal sealing surface of the inner ring 3 also
9 seats against the upper surface of the upper flange
10 portion 10A so that a double seal is obtained, and this
11 is specifically shown in Fig. 3, with the seal being
12 marked with the reference numeral 50, and in Fig. 4
13 with the seal being marked with the reference numeral
14 100.

15

16 The toilet bowl 5 is then brought into close proximity
17 vertically above seal 1, 50 and is lowered such that
18 the pins projecting upwardly through the holes 12 are
19 aligned with the grooves, recesses or holes in the base
20 of the toilet, and the outer diameter of the waste
21 outlet pipe 25 is brought to bear against the inner
22 diameter of the inner ring 3.

23

24 The upper seal portion 1A is dimensioned such that
25 there is an interference fit between the inner diameter
26 of the upper seal portion 1A and the outer diameter of
27 the waste outlet pipe 25 with approximately half the
28 vertical distance of the waste outlet pipe 25 inserted
29 into the cross-sectional area defined by the uppermost
30 portion of the inner ring 3. Therefore, continued
31 downward movement of the toilet bowl 5 (through weight
32 or tightening of the fixings etc) will expand the inner
33 ring 3 as the frusto-conical shaped waste outlet pipe
34 25 moves therethrough, until the groove 4 is
35 substantially collapsed, and the outer diameter of the
36 inner ring butts against the inner diameter of the

1 outer ring. The upwardly projecting pins and the
2 respective grooves are dimensioned such that the pins
3 will normally bear none of the weight of the toilet
4 bowl 5 and the seal 1, 50 will normally bear a portion
5 of the weight of the toilet bowl 5, with rest of the
6 weight of the toilet bowl 5 being borne by the outer
7 rim (not shown) of the base of the toilet bowl 5. The
8 seal can be compressed by the weight of the bowl or by
9 the fixings being tensioned between the bowl and the
10 floor or as previously described. This can cause the
11 columns 2,3 to deform to maintain compressive force on
12 the flange, and in certain circumstances the vacuum
13 created in the groove between the columns enhances the
14 seal. In many cases, the weight of the toilet will not
15 be sufficient to deform the seal, and the fixings are
16 tightened to enhance the seal.

17
18 At this point, both of the lower horizontal sealing
19 surfaces of the inner 3 and outer 2 rings will be in
20 contact with the upper surface of the upper flange
21 portion 10A, and the weight of the toilet bowl 5 will
22 also aid compression of the upper seal portion 1A
23 against the upper sealing surface of the upper flange
24 portion 10A.

25
26 Therefore, an increased and enhanced sealing function
27 is provided by the rubber seal 1, 50. Preferred
28 dimensions of the rubber seal are shown in Fig. 2, and
29 it can also be seen that the outer surface of the outer
30 2 and inner 3 rings, and the body member 7 may not be
31 constant but may be ridged 35 or concertinaed 35, and
32 this can be seen in greater clarity in Fig. 5. This
33 ridging 35 effect provides the advantage that the
34 displacement of the inner 3 and outer 2 rings due to
35 their expansion is increased, which may increase the
36 sealing effect of the substantially horizontal seal

1 surfaces located on the lowermost faces of the outer 2
2 and inner 3 rings.

3
4 Alternatively, and as shown in Fig. 4, it should be
5 noted that the seal 1, 50 could be arranged such that
6 when the toilet bowl 5 is brought into close proximity
7 vertically above the seal 1, 50 and is lowered, a lower
8 most and substantially horizontal seal surface 40 of
9 the toilet bowl 5 is brought to bear against the
10 uppermost face of the body 7. In this scenario,
11 continued downward movement of the toilet bowl 5 will
12 compress the body 7 downwards, and will tend to splay
13 the outer ring 2 radially outwardly, and the inner ring
14 3 radially inwardly, such that the upper seal portion
15 1A is spread out flat with its post-splayed lower most
16 sealing face being provided by the pre-splayed outer
17 diameter of the inner ring 3, lower face of the body
18 member 7 and the pre-splayed inner diameter of the
19 outer ring 2, where the post-splayed lower most sealing
20 face forms a seal against the upper surface of the
21 upper flange portion 10A.

22
23 It should also be noted that however the upper seal
24 portion 1A is compressed, the vertically spaced seal
25 rings 22A, 22B will slide up and down with respect to
26 the lower flange portion 10C, as required, during the
27 compression therebetween. A lubricating fluid, such as
28 silicon oil for example, could be applied to the seal
29 rings 22A, 22B, to aid the sliding movement.

30
31 Fig. 6 shows an alternative embodiment of the upper
32 seal portion 1A as having a 'C' shaped cross-section,
33 with an upper horizontal disc member 52, a vertical
34 body member 53 and a lower horizontal disc member 54
35 all being, preferably, integrally formed together.
36 When the substantially horizontal seal surface 40, or

1 the waste outlet pipe 25 as appropriate, bear against
2 the upper seal portion 1A, the vertical body member 53
3 will tend to collapse, by either radially inward or
4 outward compression, and thus allowing the upper disc
5 member 52 to move toward the lower disc member 54, such
6 that they are compressed together to form the seal
7 between the upper flange portion 10 and the toilet bowl
8 5.

9
10 Fig. 7 shows another alternative embodiment of the
11 upper seal portion 1A as being in the form of an 'O'-
12 ring section 62, with the 'O'-ring section 62 being
13 integrally formed with the middle seal portion 1B. The
14 'O'-ring section 62 will expand and/or compress during
15 installation of the toilet bowl 5, although perhaps not
16 to the degree of the outer embodiments.

17
18 Fig. 8 shows another alternative embodiment of the
19 upper seal portion 1A as comprising a triangular body
20 64 and a flap extension 66, where the flap extension 66
21 is, in essence, a continuation of the middle seal
22 portion 1B. The triangular body 64 and the flap
23 extension 66 are formed integrally with the middle seal
24 portion 1B. In use of this alternative embodiment of
25 the upper seal portion 1A, the lowermost and horizontal
26 face 65 of the triangular body 64 is placed against the
27 upper flange portion 10A. When the substantially
28 horizontal seal surface 40 or the waste outlet pipe 25
29 as appropriate, bear against the inner diameter of the
30 flap extension 66, the flap extension 66 will pivot
31 around its junction with the triangular body 64, and
32 will thus form a seal between the toilet bowl 5 and the
33 flange 10.

34
35 Fig. 9 shows yet another alternative embodiment of the
36 upper seal portion 1A, this time being shown as a right

1 hand side view. Upper seal portion 1A of this
2 embodiment comprises an annular ring 70, which is
3 substantially rectangular in cross-section, as being
4 coupled to the middle seal portion 1B, and where an
5 inwardly facing disc 72 is provided on the inner
6 diameter face of the annular ring 70. Thus, when the
7 outer diameter of the waste outlet pipe 25 is inserted
8 through the inwardly facing disc 72, the disc 72 seals
9 against the outer diameter of the toilet outlet pipe
10 25.

11
12 Fig. 13 shows another alternative embodiment of the
13 upper seal portion 1A as a right hand side view, as
14 comprising an outer annular seal ring 102 and an inner
15 annular seal ring 103 conjoined by a lower body member
16 107, where the inner 103 and outer 102 annular seal
17 rings are radially spaced apart, such that there is a
18 groove 104 formed therebetween. The innermost portion
19 of the inner seal ring 103 provides a coupling point at
20 which the middle seal portion 1B is coupled to the
21 upper seal portion 1A. The seal of Fig. 13 is
22 installed broadly in the same manner as the seal of
23 Fig. 1, although the lowermost face of the lower body
24 member 107 will seal against the upper surface of the
25 upper flange portion 10A.

26
27 Fig. 14 shows a further example of a seal 110 in
28 accordance with the present invention comprising an
29 upper seal portion 1A which has an outer ring 112 and
30 an inner ring 113 where the outer 112 and inner 113
31 rings are conjoined by means of a body member 117. The
32 outer 112 and inner 113 rings are radially spaced
33 apart, such that a groove 114 is provided therebetween.
34 Furthermore, the outer 112 and inner 113 rings are
35 arranged such that they angle outwardly from the body
36 member 117, such that their respective lower most in

1 use ends are further apart than their respective upper
2 most ends. Therefore, the cross-section of the upper
3 seal portion 1A takes the shape of an inverted "V",
4 with the lower surfaces of the outer 112 and inner 113
5 rings providing a horizontal sealing surface when the
6 seal ring 110 is in the configuration shown in Fig. 14.
7 The innermost point of the inner ring 113 again
8 provides a coupling point at which the middle seal
9 portion 1B is coupled to the upper seal portion 1A.

10
11 Fig. 14 also shows the seal 110 as having a lower most
12 'O' ring seal 122 integral with the lower seal portion
13 1C instead of the upper 22A and lower 22B seal rings of
14 the seal 1 of Fig. 1, where the 'O' ring seal 122 seals
15 against the inner diameter of the lower flange portion
16 10C, or an inner diameter of an sewer pipe 130 as
17 appropriate (and which will be detailed subsequently).
18 The outer diameter of the 'O' ring seal 122 can be
19 varied during the manufacturing process to suit
20 individual applications between the relatively large
21 outer diameter 'O' ring seal 122 and the smaller outer
22 diameter 'O' ring seal 123 shown in Fig. 14 in phantom.
23

24 The uppermost end of a sewer pipe 130 is shown in Fig.
25 14, whereby the lower most end of the flange portion
26 10C is dimensioned to fit within the inner diameter of
27 the pipe 130. However, it should be noted that the
28 flange portion 10C may be dimensioned such that it's
29 inner diameter is greater than the outer diameter of
30 the pipe, so that the flange portion 10C fits over the
31 pipe 130. In this scenario, the 'O' ring seal 122 or
32 123 seals against either of the inner diameter of the
33 flange portion 10C or sewer pipe 130, depending on the
34 axial extent of the seal 110. The circular cross-
35 section of the 'O' ring seal 122 or 123 provides the
36 further advantage that snagging of the seal 110 whilst

1 using a rod and brush to clean the pipe is prevented.

2

3 The uppermost face of the body member 117 has a full
4 radius formed thereon, which provides the seal 110 with
5 enhanced sealing properties against the underside of
6 the toilet bowl 5. In addition, the seal 110 is
7 optimally formed from a relatively soft elastic
8 material, such as rubber, thermoplastic rubber or
9 polyurethane and hence the material of the seal 110 and
10 particularly of the upper seal portion 1A deforms upon
11 compression between the toilet bowl 5 and the flange 10
12 so as to compensate for imperfections in either
13 respective sealing surface.

14

15 The upper seal portion 1A is provided with one or more
16 wings or tabs 132 which project horizontally outwardly
17 from the outer ring 112 at the base thereof. The
18 tab(s) 132 are provided with an aperture 134 therein
19 through which a screw or bolt can pass to facilitate
20 fixation of the seal 110 and the bowl to the flange 10.
21 Typically, the head of the bolt is located in
22 additional screw holes of the flange 10, such that the
23 bolt projects upwardly through the aperture 134. In a
24 preferred embodiment the diameter of the holes 134 in
25 the tabs are slightly smaller than the bolts and can be
26 used for gripping and locating the bolts in position
27 before the toilet bowl is put in place. The tabs also
28 serve to locate the seal in the correct position.

29

30 Another example of a seal 140 in accordance with the
31 invention is shown in Fig. 15 and is similar to the
32 seal 110 of Fig. 14 in most respects. However, seal
33 140 has an additional component in the form of a
34 membrane 142 which is integral with the seal 140, and
35 which extends fully across the bore of the seal 140 at
36 the junction between the lower seal portion 1C and

1 middle seal portion 1B. The membrane is preferably
2 formed from the same material as the rest of the seal
3 140 in order to ease manufacture, and can be used to
4 permit pressure testing of the sewer pipe 130 system.
5 Once pressure testing has been concluded the membrane
6 142 can be removed from the seal 142 by any suitable
7 means such as piercing, cutting etc. The membrane 142
8 can alternatively be formed at the junction between the
9 upper portion 1A and the middle portion 1B.

10

11 Fig. 16 shows another example of a seal 150 in
12 accordance with the present invention and, with the
13 exception of the upper seal portion 1A, is similar to
14 the seal 110 of Fig. 14. The upper seal portion 1A of
15 the seal 150 is provided with a solid, elastic,
16 circular cross-section upper seal 152 which can be
17 thought of as a vertically projecting semi-'O' ring
18 seal 152 which seals against the lower sealing face of
19 the toilet bowl 5. This semi-'O' ring seal 152 may be
20 of a softer material such as rubber, thermoplastic
21 rubber or polyurethane with respect to the other seals
22 described herein, or with respect to the rest of the
23 seal 150, such that it will deform to a greater extent
24 whilst providing an enhanced sealing effect.

25

26 Fig. 17 shows yet another example of a seal 160 in
27 accordance with the present invention and is similar to
28 the seal 110 of Fig. 14 in most respects. However,
29 seal 160 has localised radiused protrusions 165 mounted
30 on, and preferably integral with, the upper surface of
31 the body member 167 of the upper seal portion 1A.
32 These protrusions 165 are, in fact, a plurality of
33 vertically projecting 'O' ring seals 165 which increase
34 in diameter from the innermost to the outermost
35 protrusion, and which seal against the lowermost
36 sealing surface of the toilet bowl 5, thereby

1 increasing the sealing effect with the bowl 5,
2 particularly for localised porous toilet bowls 5.

3
4 Fig. 18 shows yet another example of a seal 170 in
5 accordance with the present invention and is similar to
6 the seal 110 of Fig. 14 in most respects. However,
7 seal 170 has inwardly projecting annular discs or fins
8 176 mounted on, and preferably integral with, the inner
9 surface of the inner ring 173 of the upper seal portion
10 1A. The fins 176 can be dimensioned to be an
11 interference fit with the outer diameter of the toilet
12 outlet pipe 25, thereby increasing the sealing effect
13 therewith.

14
15 Fig. 19 shows yet another example of a seal 180 in
16 accordance with the present invention and is similar to
17 the seal 110 of Fig. 14 in most respects. However, the
18 body member 187 of the seal 180 has a an upper surface
19 which is substantially flatter than the full radius
20 provided on the upper surface of the body member 117 of
21 the seal 110.

22
23 Fig. 20 shows the seal 110 of Fig. 14 in isolation from
24 the toilet bowl 5 and flange 10 for greater clarity.

25
26 The seal 1 therefore provides the advantage that it
27 does not melt if distorted but, in fact, is capable of
28 recovering its original shape. The seal 1 further
29 provides a water- and air-tight seal even if distortion
30 or displacement of the seal 1 occurs. It further
31 accommodates expansion and contraction of the pipework
32 connected to the municipal system due to temperature
33 fluctuations, and is always in compression thus forming
34 a positive seal between the flange 10 and the waste
35 outlet pipe 25. Further, the seal 1 can be easily and
36 readily installed into a new toilet installation, and

1 can further be retro-fitted into an existing toilet
2 assembly. Further, the seal 1 compensates for
3 differences in tolerances between the inner diameter of
4 the flange 10 and the outer diameter of the waste
5 outlet pipe 25.

6
7 Modifications and improvements may be made to the
8 embodiments without departing from the scope of the
9 invention. For instance, the particular shape of the
10 seal 1 may be varied in individual cases to suit the
11 particular shape of the toilet bowl 5 and the flange 10
12 in between which the seal 1 is to be placed. The
13 design of certain embodiments of the seal uses the
14 elastic/resilient properties of the elastomer to
15 maintain a constant sealing pressure on the underside
16 of the toilet and the top of the flange when placed in
17 compression. A further advantage of certain conically
18 shaped embodiments of the invention is that they can be
19 compressed axially to a small size for transport.

20
21

1 CLAIMS:-

2

3 1. A seal for a toilet outlet, the toilet outlet
4 comprising a waste outlet from a toilet bowl for fluid
5 connection with a waste removal system, the seal being
6 adapted to provide a seal between the waste outlet and
7 the waste removal system, wherein the direction of
8 travel of the waste from the waste outlet to the waste
9 removal system is substantially vertical, and
10 characterised in that the seal is formed from a
11 resilient material.

12

13 2. A seal according to claim 1, wherein the toilet
14 outlet further comprises a connection device for
15 connecting the waste outlet to the waste removal
16 system.

17

18 3. A seal according to either of claims 1 or 2,
19 wherein the seal is formed from a material having one,
20 some or all of the following characteristics;
21 elasticity, the ability to regain its original shape or
22 position after bending, stretching, compression or
23 other deformation.

24

25 4. A seal according to any preceding claim, wherein
26 the waste outlet is located on the lowermost portion of
27 the toilet bowl.

28

29 5. A seal according to any preceding claim, wherein
30 the waste outlet protrudes downwardly from the toilet
31 bowl.

32

33 6. A seal according to any preceding claim, wherein
34 at least a portion of the waste outlet is frusto-
35 conically shaped, with the greatest cross-sectional
36 area of the waste outlet vertically uppermost.

1 7. A seal according to any preceding claim, wherein
2 the seal comprises a bore through which waste can
3 travel.

4

5 8. A seal according to claim 7, wherein the seal is
6 generally symmetrical about the longitudinal axis of
7 the bore.

8

9 9. A seal according to any preceding claim, wherein
10 the seal comprises, when in use, an upper portion which
11 comprises an upper surface against which a portion of
12 the bottom of the toilet bowl seats.

13

14 10. A seal according to claim 9, wherein the upper
15 portion comprises a recess formed therein, the recess
16 providing for displacement of the upper portion.

17

18 11. A seal according to either of claims 9 or 10,
19 wherein the upper portion of the seal further comprises
20 at least two annular seals coupled to a body.

21

22 12. A seal according to claim 11, wherein the recess
23 in the upper portion of the seal is provided in the
24 region defined between the two annular seals and the
25 body.

26

27 13. A seal according to either of claims 11 or 12,
28 wherein in use of the seal, the annular seals of the
29 upper portion of the seal are vertically lowermost, and
30 the body is vertically uppermost.

31

32 14. A seal according to either of claims 11, or claim
33 12 when dependent on claim 11, wherein respective ends
34 of the body are each coupled to one of the annular
35 seals.

36

1 15. A seal according to any of claims 11 to 14,
2 wherein a base of at least one of the annular seals
3 forms a seal surface for sealing against a seal surface
4 provided on the connection device.

5

6 16. A seal according to any preceding claim, wherein
7 the connection device is a flange.

8

9 17. A seal according to any of claims 11 to 16,
10 wherein in use of the seal, the two annular seals may
11 be compressed toward one another by the compressive
12 force provided by the weight of the toilet bowl.

13

14 18. A seal according to claim 17, wherein the annular
15 seals are displaced towards one another to a
16 substantial extent such that they bear against one
17 another.

18

19 19. A seal according to claim 18, wherein the recess
20 is substantially collapsed, and the base of the two
21 respective annular seals form respective seal surfaces
22 for sealing engagement against a seal surface provided
23 on the connection device.

24

25 20. A seal according to any of claims 11 to 16,
26 wherein the two annular seals may be splayed apart from
27 one another by the compressive force provided by the
28 weight of the toilet bowl.

29

30 21. A seal according to claim 20, wherein faces of the
31 annular rings which are adjacent the recess provide
32 respective seal surfaces for sealing engagement against
33 the sealing surface provided on the connection device.

34

35 22. A seal according to any of claims 9 to 21, wherein
36 the upper portion of the seal comprises an inner

1 annular seal and an outer annular seal, and the inner
2 annular seal is located radially inwardly of the outer
3 annular seal.

4
5 23. A seal according to claim 22, wherein the outer
6 annular seal is coaxial with respect to the inner
7 annular seal.

8
9 24. A seal according to claims 9 to 23, wherein the
10 seal further comprises a lower portion which is coupled
11 to the upper portion, and which is provided with at
12 least one sealing element for sealing engagement
13 against a lower portion of the connection device, or
14 against a portion of the waste removal system.

15
16 25. A seal according to claim 24, wherein the sealing
17 element is a seal ring which is preferably arranged on
18 the outer circumference of the lower portion.

19
20 26. A seal according to claim 25, wherein the seal
21 ring protrudes outwardly from an outer circumference of
22 the lower portion to seal against an inner
23 circumference of the connection device or the waste
24 removal system.

25
26 27. A seal according to either of claims 25 or 26,
27 wherein there are a plurality of seal rings provided on
28 the lower portion, the plurality of seal rings being
29 axially spaced with respect to the longitudinal axis of
30 the bore of the seal.

31
32 28. A seal according to any of claims 24 to 27,
33 wherein the seal further comprises a middle portion
34 which couples the upper portion of the seal to the
35 lower portion.

36

1 29. A seal according to any of claims 24 to 28,
2 wherein the inner diameter of the upper portion of the
3 seal is of a different diameter to the inner diameter
4 of the lower portion.
5

6 30. A seal according to either claim 28 or to claim 29
7 when dependent on claim 28, wherein the middle portion
8 is frusto-conically shaped, with one end of the middle
9 portion being coupled to the upper portion, and the
10 other end being coupled to the lower portion.
11

12 31. A seal according to either claim 29 or claim 30
13 when dependent on claim 29, wherein the outer diameter
14 of the upper portion of the seal is greater than the
15 outer diameter of the lower portion.
16

17 32 A seal according to any one of the preceding
18 claims, having tabs with supporting apertures for
19 fixings.
20

21 33. A toilet having a bowl, and an outlet for waste
22 from the bowl connected to a waste removal system,
23 wherein the direction of travel of the waste from the
24 waste outlet to the waste removal system is
25 substantially vertical, the outlet being sealed to the
26 waste removal system by a seal as claimed in any
27 preceding claim.
28

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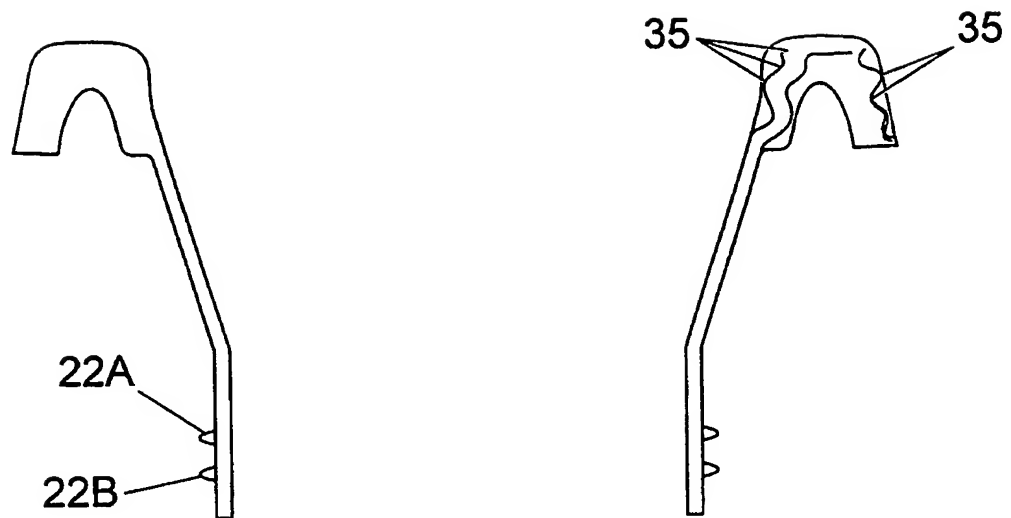


Fig. 2

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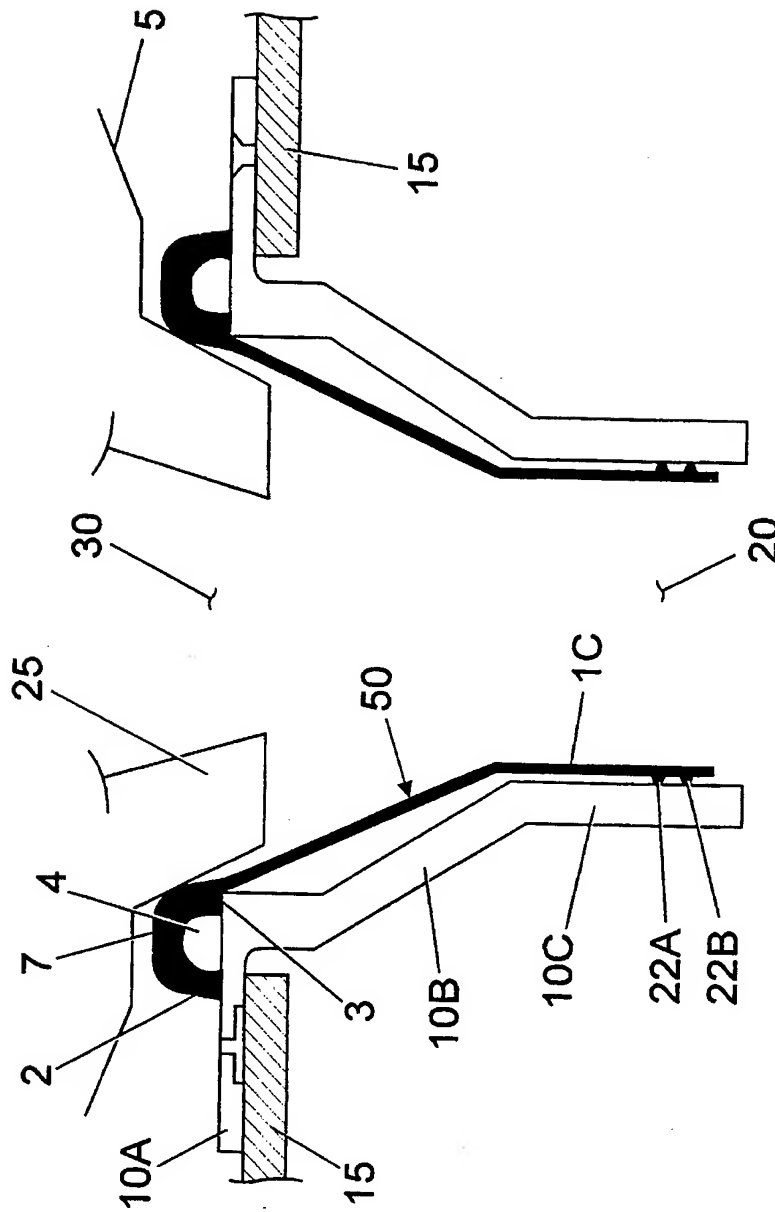


Fig. 3

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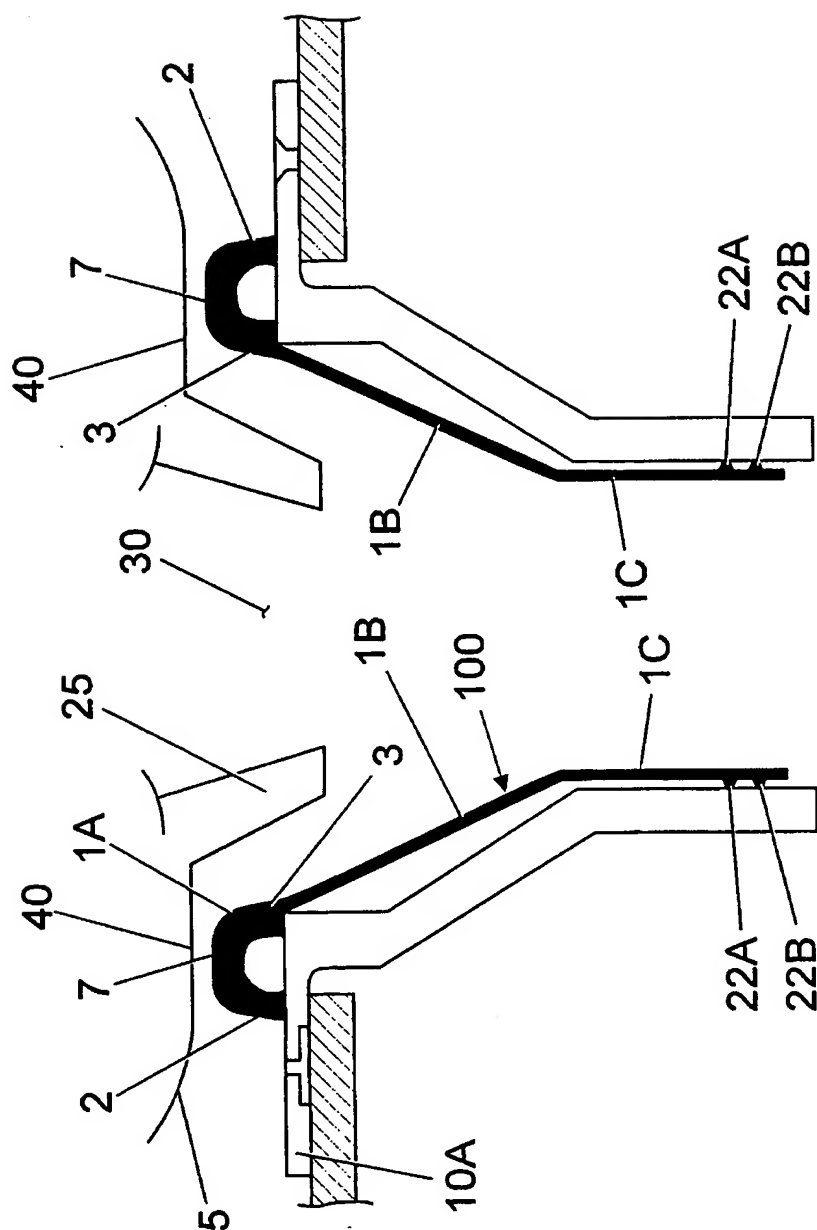
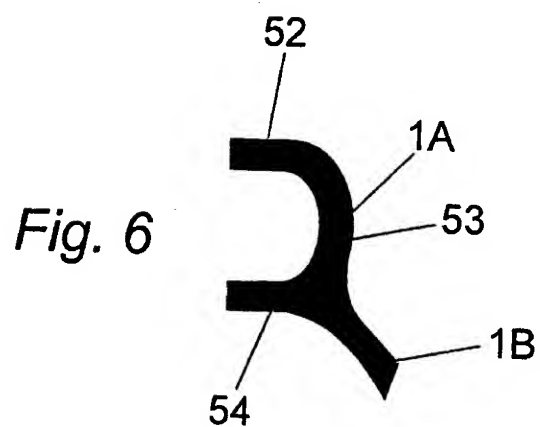
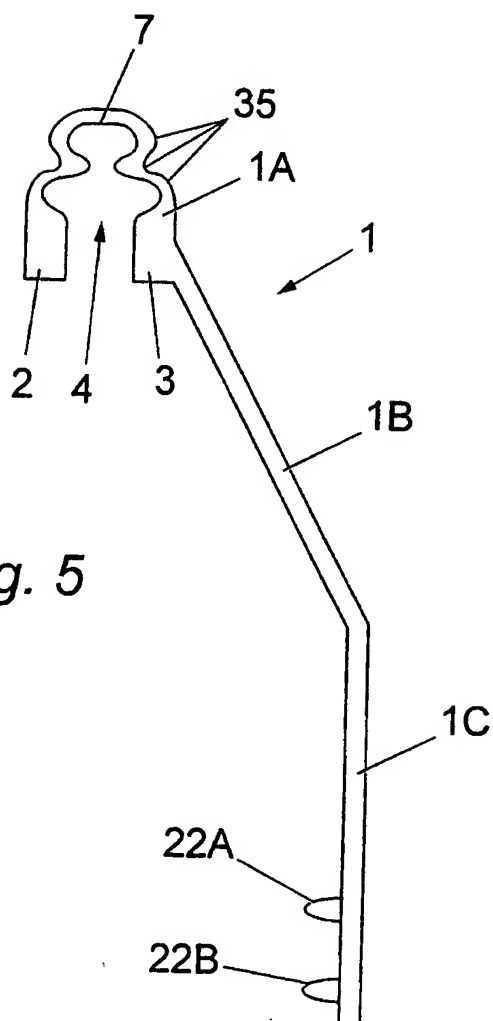


Fig. 4

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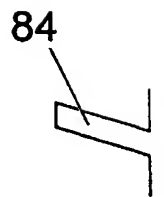
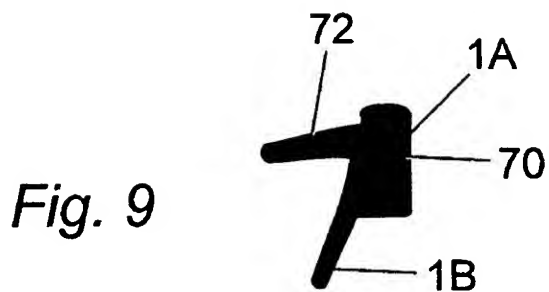
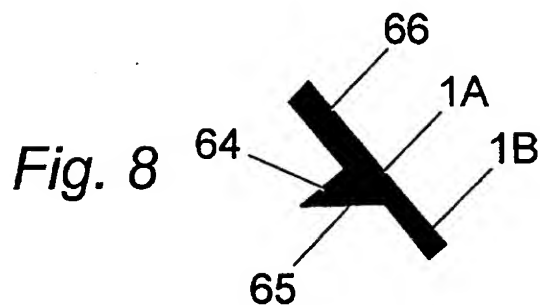
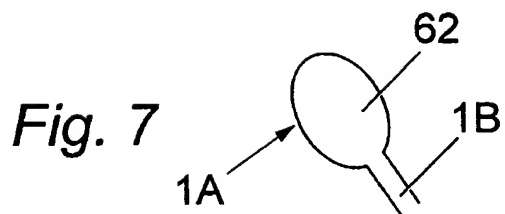
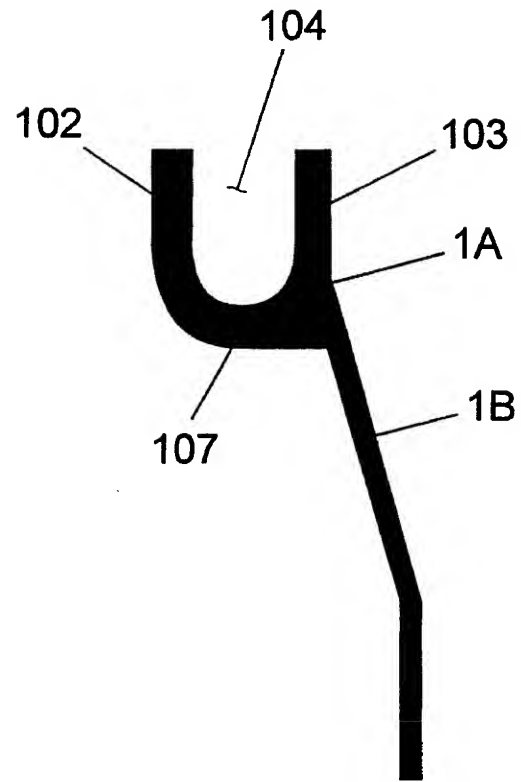


Fig. 10

Fig. 11

Fig. 12

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*Fig. 13*

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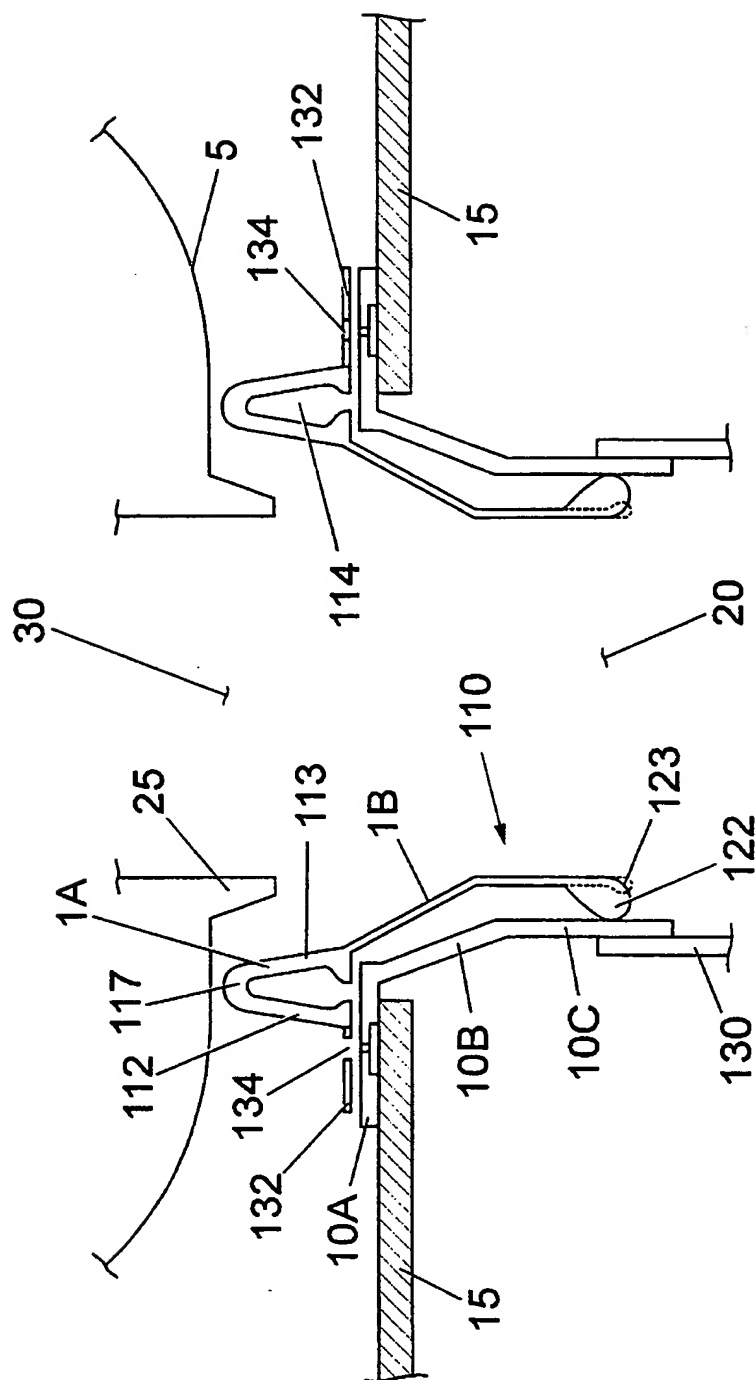
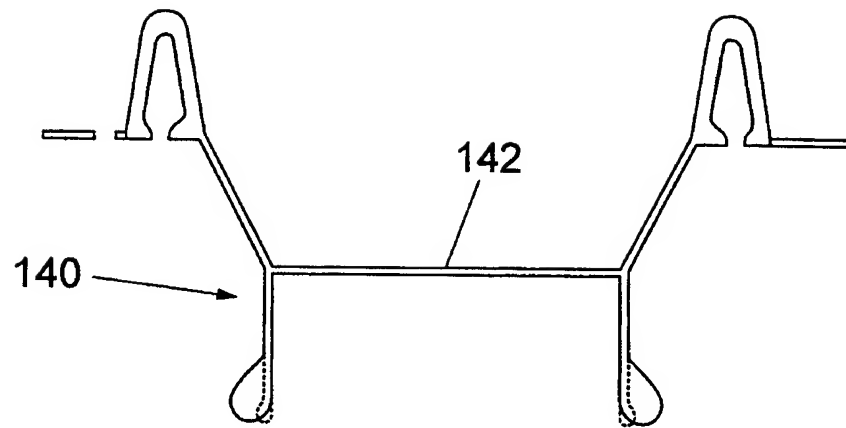
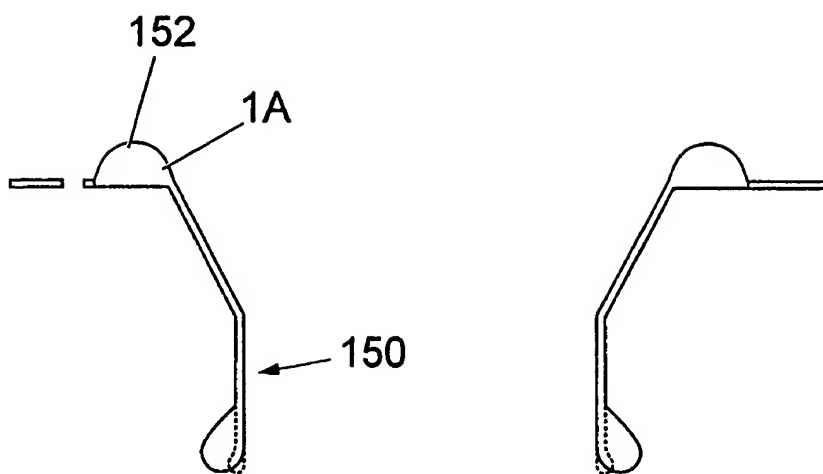


Fig. 14

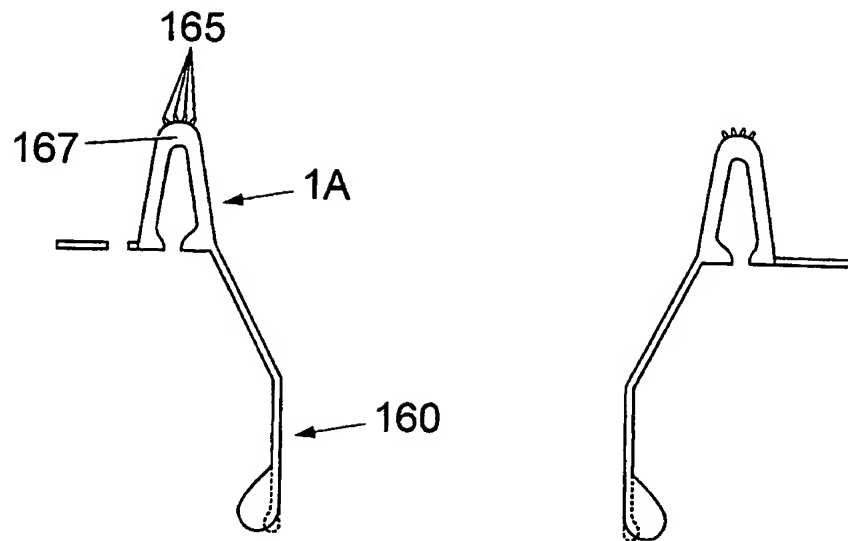
9 / 14

*Fig. 15*

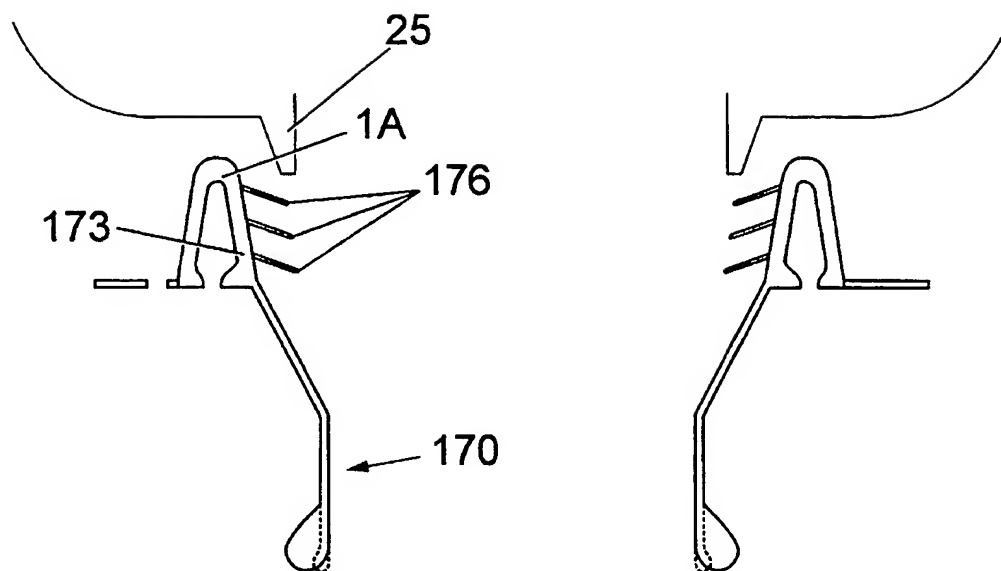
10 / 14

*Fig. 16*

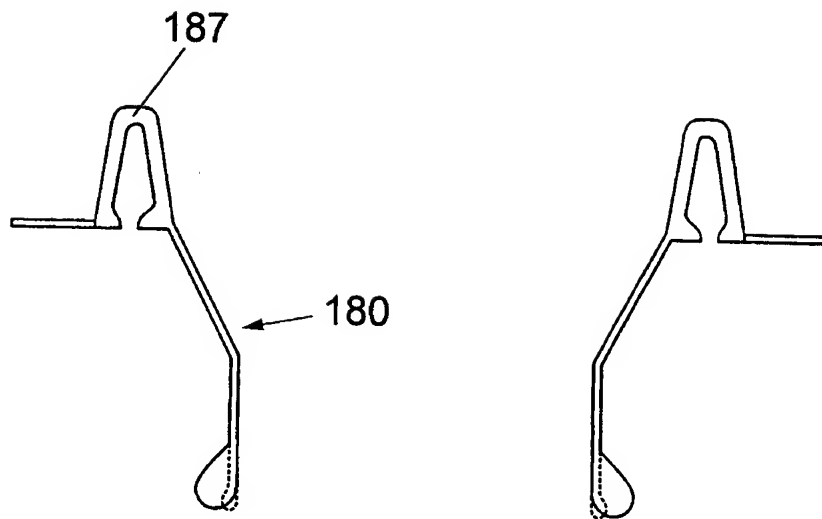
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*Fig. 17*

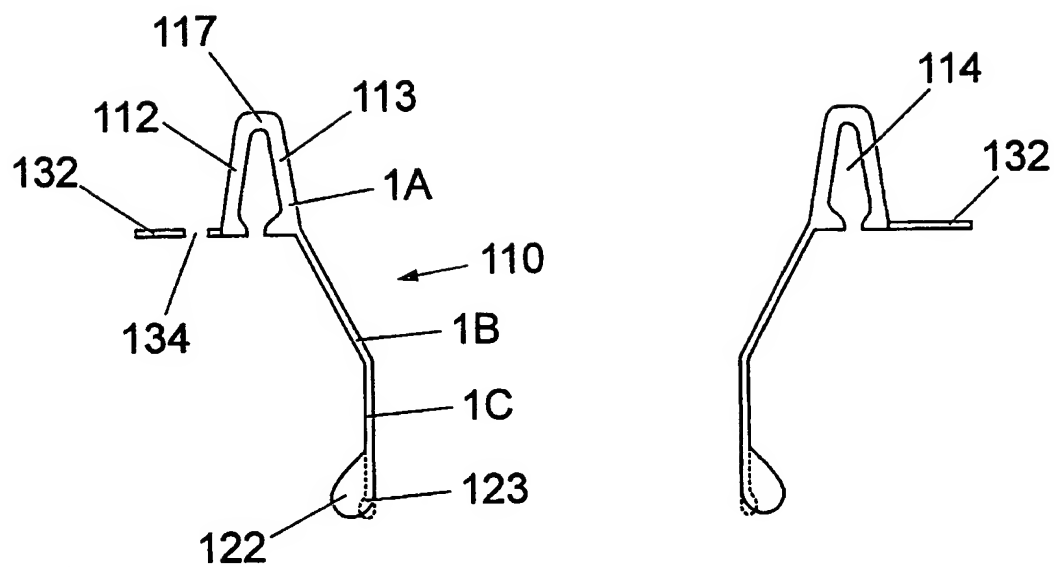
12 / 14

*Fig. 18*

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*Fig. 19*

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*Fig. 20*

INTERNATIONAL SEARCH REPORT

Int. l. Application No

PCT/GB 99/02648

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 E03D11/16

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 E03D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5 185 890 A (DISMORE GREGORY W ET AL) 16 February 1993 (1993-02-16) column 3, line 10 -column 4, line 63; figures	1-9, 16, 32, 33
Y	---	24-31
Y	US 2 976 543 A (TURNER ET AL.) 28 March 1961 (1961-03-28) column 2, line 70 -column 4, line 64; figures	24-31
X	GB 872 843 A (KLEINHOF) page 2, line 6 - line 64; figures 1,2 -/--	1, 3-5, 7-17, 22, 23, 33

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

21 December 1999

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INTERNATIONAL SEARCH REPORT

International Application No

PCT/GB 99/02648

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
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INTERNATIONAL SEARCH REPORT

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International Application No

PCT/GB 99/02648

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